OBG

REVISED REPORT

Focused Feasibility Study Amendment
Semet Residue Ponds Site
Geddes, New York

Honeywell

February 2017

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Revised
Focused Feasibility Study Amendment
Semet Residue Ponds
Geddes, New York

Prepared for:

Honeywell

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LIST OF ACRONYMS

ACO	Administrative Consent Order
ARAR	Applicable or Relevant and Appropriate Requirement
BUD	Beneficial Use Determination
cy	cubic yards
FS	Feasibility Study
FFS	Focused Feasibility Study
Ft	feet or foot
GWTP	Groundwater Treatment Plant
IRM	Interim Remedial Measure
Metro	Metropolitan Wastewater Treatment Plant
MG	million gallons
NPL	National Priorities List
NYCRR	New York Codes, Rules and Regulation
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
OBG	O'Brien & Gere
OU	Operable Unit
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
RSTS	Remedy Selection Treatability Study
USEPA	United States Environmental Protection Agency

1. INTRODUCTION

1.1 OBJECTIVES AND OVERVIEW

This Focused Feasibility Study (FFS) Amendment was prepared to update the evaluation of the off-site thermal processing for reuse alternative for Semet Residue at the Semet Residue Ponds Site (Site), located in the Town of Geddes, New York. The Site is a Class 2 site on the New York State Registry of Inactive Hazardous Waste Disposal Sites (Site #7-34-008) and a sub-site to the Onondaga Lake National Priorities List (NPL) site. As described in more detail in Section 1.2, a Record of Decision (ROD) was issued by the New York State Department of Environmental Conservation (NYSDEC) and the United States Environmental Protection Agency (USEPA) in March 2002 (NYSDEC and USEPA 2002) that presented the remedy to address Semet Residue in ponds and groundwater at the Site. The 2002 ROD remedy for the Semet Residue, removal and on-site processing to produce a soft tar product, RT-12, for reuse in off-site driveway sealer production, was not implemented due to changes in market conditions. Remedial alternatives for the Semet Residue were re-evaluated in a 2006 *FFS Report* (OBG 2006), prepared under a 2004 Administrative Consent Order (ACO; # D7-0005-01-09; NYSDEC 2004). An alternate on-site process for beneficial reuse remedy was concluded to best meet the FS evaluation criteria for the Semet Residue in the 2006 *FFS Report* (OBG 2006). Subsequent to the 2006 FFS, findings regarding reduced estimated quantities of Semet Residue and changes in the market for anticipated products (solvents and fuel "heel") prompted re-evaluation of the off-site thermal processing/reuse alternative.

This FFS Amendment provides updated Semet Residue quantity estimates and the updated evaluation of the off-site thermal processing/reuse alternative.

1.2 BACKGROUND

Before 1917, the Site was a settling basin (Wastebed A) for Solvay process waste, a material that consists largely of calcium carbonate and gypsum. From 1917 to 1970, waste Semet Residue from Honeywell's former Benzol plant was deposited in five bermed excavations in Wastebed A. Semet Residue is an organic-based substance generated from the fractional distillation of coke light oil.

On March 28, 2002, following completion of the Remedial Investigation/Feasibility Study process and public comment, NYSDEC and USEPA documented their selection of a final remedial alternative for the Semet Residue in ponds and groundwater at the Site in a ROD (NYSDEC and USEPA 2002). The selected remedy included measures to prevent the migration of contaminated groundwater, and to manage and treat the Semet Residue. These components of the remedy are further described below.

Groundwater Migration Remedial Component.

The groundwater remedy included installation of a stone-filled shallow groundwater collection trench to address groundwater discharges to Tributary 5A and a watertight sheet pile wall, collection trench, and groundwater extraction wells to address groundwater discharges to Onondaga Lake, located north of the Site.

From 2006 to 2007, approximately 1,200 linear feet of sheetpile barrier wall and groundwater collection system were installed as part of the Lakeshore Hydraulic Containment System (LHCS) interim remedial measure (IRM) to collect shallow and intermediate groundwater prior to discharge to Onondaga Lake. The Semet portion of this IRM extends from the vicinity of Tributary 5A to the east where it connects with the Willis Avenue barrier wall and associated groundwater collection system (Parsons 2012). Construction of the LHCS IRM was completed in accordance with the *95% Design Report for Semet Portion of IRM* (Parsons 2006).

From 2010 to 2012, the following groundwater migration remedial components were installed at the Site to address Site groundwater discharges to Tributary 5A (OBG 2013):

- Construction of a shallow sand-filled groundwater collection trench with a slotted Fiberglass Reinforced Plastic (FRP) groundwater collection pipe;

- Construction of two groundwater pump stations (GWPSs) designed to convey collected groundwater to the Willis Avenue groundwater treatment plant (GWTP);
- Installation of an FRP pipe and Ductile Iron Pipe (DIP) force main;
- Excavation and relocation of Semet material from the Stringer Ponds;
- Excavation and relocation of material from within the Tributary 5A limits;
- Installation of an isolation layer and placement of material within the Tributary 5A limits;
- Culvert cleaning and inspection; and
- Site grading and restoration of the tributary banks and channel.

Construction of the Tributary 5A groundwater collection system was completed in accordance with the contract drawings and technical specifications provided in the *95% Remedial Design Report* (OBG 2008). Operation, maintenance, and monitoring of the groundwater remedy is ongoing.

Semet Residue Remedial Alternative

The Semet Residue remedial alternative consisted of reuse of the Semet Residue through removal and processing of pond residue to produce a soft tar product (RT-12), which would be used to make driveway sealer at an off-site location. The ROD also established a second operable unit for contaminated material that exists beneath and in proximity to the Semet Residue Ponds. In January 2002 (NYSDEC 2002), NYSDEC approved Honeywell's December 1999 beneficial use determination (BUD)[1] petition (OBG 1999b). The BUD stated that the proposed reclamation and commercial sale of the Semet Residue constituted a beneficial use, and the specified products were not considered a solid waste under 6 NYCRR 360.

Following the issuance of the ROD in 2002, Honeywell asked NYSDEC to modify the selected Semet Residue remedial alternative because of changes in market conditions. NYSDEC agreed that the modification could be evaluated in an FFS. On January 22, 2004, NYSDEC and Honeywell executed an ACO (# D7-0005-01-09; NYSDEC 2004), which:

- Required that any modification of the ROD-selected Semet Residue remedial alternative be based on the results of an FFS
- Specified that the FFS develop and evaluate four remedial alternatives for the Semet Residue (a no further action alternative, a modified on-site reuse alternative, off-site thermal treatment or disposal, and on-site thermal treatment)
- Specified the remedial design/remedial action (RD/RA) requirements for the selected groundwater and Semet Residue remedial alternatives.

A final FFS Work Plan was submitted to NYSDEC on July 7, 2004 (OBG 2004b) and was approved on July 9, 2004. A work plan for a fuel recycling pilot study was submitted to NYSDEC on June 10, 2004 (OBG 2004a). The results of the study (OBG 2005a) were used to examine the on-site reuse alternative for the Semet Residue.

A final FFS Report incorporating NYSDEC's comments dated April 7, 2006 (NYSDEC 2006a) was submitted to NYSDEC on July 10, 2006. Based on the FFS, a new reuse alternative, on-site distillation for beneficial reuse, best met the FS evaluation criteria for the Semet Residue, and a new BUD petition was prepared; the final revised BUD petition, incorporating NYSDEC comments, dated April 7, 2006 (NYSDEC 2006b), was submitted to NYSDEC in August 2006 (OBG 2006b) and approved on November 21, 2006.

[1] A BUD is a designation made by NYSDEC to identify whether solid waste management regulations apply to a waste material which is to be beneficially used. The 1999 petition was submitted to request NYSDEC's approval of a BUD for three processing wastes which had commercial uses: RT-12, solvent, and light oil fuel.

During preliminary conceptual design related to the on-site distillation for beneficial reuse alternative in 2008 and 2009, review of historical photographs and additional information indicated that a re-evaluation of the Semet Residue volume was necessary. Two field investigations were completed in 2009 and 2010 to refine the estimated volume of Semet Residue - a volume verification investigation (OBG 2009) and an OU1 Pre-Design Investigation (PDI; OBG 2010). As documented in the *OU1 PDI Report*, the estimated volume of Semet Residue, 17 million gallons (MG), was significantly less than what was previously assumed during ROD and FFS development (60 – 80MG).

In light of the lower estimated Semet Residue volume, it was concluded that further evaluation of the off-site and on-site thermal processing for beneficial reuse alternatives were warranted. Remedy selection treatability studies (RSTSs) were conducted to reduce uncertainties related to thermal processing for beneficial reuse alternatives. RSTSs were documented in the following reports:

- June 2011 *Semet Residue Characterization for Thermal Treatment RSTS Report* (Honeywell 2011), approved on June 28, 2011
- December 2011 *Cold and Hot Weather RSTS Report* (OBG 2011), approved on February 17, 2012 (NYSDEC 2012)
- October 2014 *Expanded RSTS Report* (OBG 2014), approved on October 22, 2014.

RSTS results confirmed the potential viability of off-site thermal processing for beneficial reuse of the Semet Residue in ponds. Field demonstrations were conducted from 2014 to 2016 to provide information needed to advance remedy selection and development, including material handling and thermal processing capacity details, limitations at the cement kilns associated with material handling and chemical characteristics that could impact acceptance and/or processing rates, and the efficacy of excavation and off-site blending of the Semet Residue for cement kiln beneficial reuse (OBG 2015, 2016).

An updated evaluation of the off-site thermal processing/reuse alternative, incorporating RSTS and demonstration results, is presented in this FFS Amendment Report. This FFS Amendment Report also describes and incorporates updated Semet Residue quantity estimates, which have been further refined since the OU1 PDI, as described in Section 2.

2. VOLUMES AND AREAS OF MEDIA

The *1999 FS Report* (OBG 1999a) and 2002 ROD (NYSDEC and USEPA 2002) documented that the five Semet Residue Ponds were collectively approximately 11 acres, had an estimated depth ranging from 10 to 40 ft, and contained an estimated 80 MG of Semet Residue. In the *2006 FFS Report* (OBG 2006a), the estimated maximum depth and volume were refined to 20 ft and 60 MG, respectively. As discussed in Section 1.2, during 2008 and 2009, it was suspected that this volume of Semet Residue could not have been produced and deposited at the Site based on historical operating records. As such, additional field work, including geophysical investigation (i.e., electrical resistivity survey and TarGOST® probes), and discrete sampling, was conducted in 2009 and 2010 (OBG 2009, 2010). The 2010 Semet OU 1 PDI estimated significantly less Semet Residue [17 MG or 84,000 cubic yards (cy)] over 14 acres (OBG 2010), using a geometric calculation of each pond or Semet Material Area (SMA) area multiplied by estimated average Semet Residue depth per pond or SMA.

In addition to the five ponds, the presence of Semet Residue was identified in two SMAs, SMA-3 and SMA-5, and in stringer ponds south of Ponds 3 and 4 (see Figure 1) during the volume verification investigation and OU1 PDI. SMAs are areas of discontinuous Semet Residue outside of the pond boundaries, and the stringer ponds were areas of Semet Residue that had seeped out of the ponds. TarGOST® responses and confirmation samples within SMA-6 during the volume verification investigation and OU1 PDI did not suggest the presence of Semet Residue. SMAs 1, 2, and 4 were not investigated during the volume verification investigation and OU1 PDI, but historical test pitting conducted in these areas indicated that the extent of material visually impacted by Semet Residue was generally limited to the surface. Subsequent to the OU1 PDI, the stringer ponds and SMAs 1 and 2 were excavated and placed on Pond 2 as part of the Tributary 5A Remedial Action construction activities.

Semet Residue quantity estimates have been further refined since 2010 using GIS methodology, and continue to be evaluated as part of field demonstrations. The estimated thicknesses of Semet Residue at TarGOST® probe locations were used to generate volumes in GIS of the Semet Residue in each pond or SMA.

The updated total estimated volume of Semet Residue prior to demonstration removal efforts is 10 MG, or 49,000 cy. Because off-site transport and processing is evaluated on a mass basis, the Semet Residue mass was estimated at 47,000 tons, based on an average Semet Residue density of 0.95 ton/cy. To date (December 2016), over 21,000 tons of Semet Residue have been removed and processed during the field demonstrations (OBG 2015, 2016), leaving an estimated 26,000 tons remaining on-site. It should be noted, however, that the boundary between continuous Semet Residue and Semet Residue which is intermixed with soil/fill material is not visually distinct in some areas, lending uncertainty to quantity estimates. Investigations continue as part of pre-design evaluations to refine estimated quantities of Semet Residue, and that significant variability exists within the total quantity with respect to physical and chemical characteristics (e.g., viscosity, texture, thermal value, accessibility).

3. OFF-SITE THERMAL PROCESSING FOR BENEFICIAL REUSE ALTERNATIVE

3.1 REMEDIAL ALTERNATIVE DESCRIPTION – OFF-SITE THERMAL PROCESSING FOR BENEFICIAL REUSE

The components of the off-site thermal processing for beneficial reuse alternative include:

- Excavation of Semet Residue
- On-site dewatering of Semet Residue as needed to remove free liquids for transport
- Transport of Semet Residue off-site to a Resource Conservation and Recovery Act (RCRA)-permitted thermal processing for beneficial reuse facility
- On-site management of process aqueous generated from the dewatering screw conveyor
- Maintenance of temporary fiber-based or cement-based spray on cover as needed for odor and emission controls, and
- Fencing and site security monitoring.

Semet Residue which meets the acceptance criteria at a RCRA-permitted thermal processing for beneficial reuse facility would be excavated from the site, to the extent practicable. Semet Residue which does not meet acceptance criteria and contaminated material located below and in proximity of the ponds, and in the Brushy Cleared Area which exceed Site cleanup goals for pond residue-related contaminants will be evaluated in a site-wide Feasibility Study. Acceptance criteria are being evaluated as part of the ongoing demonstration programs, and are anticipated to be based on fuel value and inorganic solids content.

Semet Residue would be excavated from the Site using tracked excavators. Excavated Semet Residue that does not contain free aqueous phase would be placed directly in a double-lined dump trailer for off-site truck transport. Excavated Semet Residue containing free aqueous phase would be loaded into an on-site dewatering screw conveyor for dewatering. Dewatered Semet Residue would be discharged from the dewatering screw conveyor via a belt conveyor into a double-lined dump trailer for off-site truck transport. A temporary fiber-based or cement-based spray-on cover would be maintained, as needed, in excavation areas during removal activities and on the dewatering screw conveyor during dewatering operations to minimize volatile emissions and odors. As needed, methods to minimize odors off-site (e.g., orchard fans, mist curtains) would be used along sections of the perimeter fenceline.

Community air monitoring would be conducted as part of evaluation and control of potential airborne contaminant releases at the Site perimeter during excavation/intrusive work and/or dewatering operations. Air monitoring would consist of real-time continuous monitoring for total volatile organic compounds (TVOCs) and dust/particulate matter up to 10 micrometers in size (PM_{10}), and regular (grab) air monitoring for hydrogen sulfide (H_2S) and odors.

Semet Residue would be transported off-site for beneficial reuse at a RCRA-permitted facility. Demonstration programs have confirmed that Semet Residue can be managed at an off-site cement kiln (OBG 2015, 2016). Additional RCRA-permitted thermal processing for beneficial reuse facilities are being evaluated as part of the ongoing 2016 demonstration, and additional recycling outlets are being considered. Acceptance rates at the off-site facilities may vary with changing market conditions, but based on the demonstration programs, it is anticipated that acceptance rates will range from 10,000 to 15,000 tons/year. Based on this range, removal and off-site transportation efforts would be completed in between 2 and 3 years for the estimated total quantity of Semet Residue remaining after the 2016 demonstration.

It is anticipated that aqueous phase generated from the dewatering process will be managed at the Willis Avenue GWTP.

A fence currently surrounds the Site and effectively restricts human contact with the Semet Residue. The fence has a locked gate for security. Site security monitoring would be routinely performed to inspect the fence and locks for breaches and to evaluate whether repairs are needed.

3.2 REMEDIAL ALTERNATIVE ANALYSIS

With the exception of the no further action alternative, each of the alternatives evaluated in the 2006 FFS (a modified on-site reuse alternative, off-site thermal treatment or disposal, and on-site thermal treatment) would provide for attainment of the following remedial action objectives (RAOs):

- Prevent direct contact with Semet Residue
- Reduce volatile emissions from the Semet Residue.

Each of the alternatives evaluated in the 2006 FFS would satisfy the threshold criteria, overall protection of human health and the environment, and compliance with applicable or relevant and appropriate requirements (ARARs).

With respect to the balancing criteria evaluation, the thermal treatment for beneficial reuse alternatives are more favorable than the remaining thermal treatment alternatives because they incorporate reuse of either the Semet Residue itself, or reuse of the product(s) generated from thermal processing (i.e., solvent, light oil). The off-site thermal treatment for reuse alternative provides the best balance because the Semet Residue would be reused in its original or dewatered form to fuel commercial cement kilns, reducing the need for use of fossil fuels. Off-site thermal treatment for reuse would also, limit on-site operations and associated potential community and worker impacts; effectiveness and implementability have been proven through the demonstration programs. Although on-site thermal processing for beneficial reuse would limit transport of the Semet Residue off-site, it requires design, construction, and operation of an on-site thermal processing system to produce solvent and heel products and would take longer to complete. Market conditions are not currently favorable for reuse of the heel product, which would therefore require residual management.

Based on the estimated off-site facility acceptance rate of 10,000 to 15,000 tons/year, removal and off-site transportation/reuse efforts would be completed in 2 to 3 years for the estimated 26,000 tons of Semet Residue remaining after the 2016 demonstration. Estimated remaining capital costs for the off-site thermal processing for beneficial reuse alternative are summarized in Table 1 and range from $27 - $30 million. There are no operation and maintenance tasks or costs associated with this removal alternative.

3.3. REMEDY MODIFICATION

The off-site thermal processing for beneficial reuse alternative is compared to the 2002 ROD remedy for the Semet Residue in Table 3-1:

Table 3-1 Comparison of 2002 ROD Remedy to Off-Site Thermal Processing for Beneficial Reuse Alternative

Components	ROD remedy	Off-site Thermal Processing for Beneficial Reuse
Removal	Excavation	Excavation
On-site processing	Dewatering and on-site thermal processing	Dewatering as needed for transport
Transportation	RT-12 soft tar product would be transported off-site to produce driveway sealer	Transport to off-site RCRA facility
Off-site processing	Off-site processing to produce driveway sealer	Thermal processing at off-site RCRA facility
Reuse	Beneficial reuse of solvent, heel, and light oil products (current market does not support reuse of heel)	Beneficial reuse of raw or dewatered tar
Aqueous phase management	On-site process aqueous phase management	On-site process aqueous phase management

Components	ROD remedy	Off-site Thermal Processing for Beneficial Reuse
Odor and emission control	Maintenance of temporary spray on cover	Maintenance of temporary spray on cover
Site security	Maintenance of fencing	Maintenance of fencing
Anticipated duration	12 years	2 – 3 years
Estimated total present worth cost	$19 - $29M in 1999 dollars, accounting for a $10-$20M credit for product sales. However, changes in market demand occurred that did not/do not support a product sales credit, and additional costs would be incurred to dispose of product.	$27M - $30M for remaining Semet Residue

Direct comparison of costs between the 2002 ROD remedy and this FFS Amendment evaluation of the off-site thermal processing for beneficial reuse alternative are not appropriate because ROD remedy costs were developed 14 years ago for a different volume of material, without the results of the thermal processing pilot study, RSTSs, and demonstrations, and incorporated an assumed income of $10-20M for product sales. FFS Amendment costs incorporate lessons learned in material handling and on-site and off-site processing, and represent costs for the estimated quantity of Semet Residue remaining after completion of the demonstrations.

4. CONCLUSION

The selected remedy for the Site includes measures to prevent the migration of contaminated groundwater, and to manage and treat the Semet Residue. Considering the updated estimated quantity of Semet Residue, current market conditions, and the results of RSTSs and demonstration programs, off-site thermal processing for beneficial reuse is a viable, implementable, and cost-effective alternative for the Semet Residue. Semet Residue which does not meet acceptance criteria and contaminated material located below and in proximity of the ponds, and in the Brushy Cleared Area which exceed Site cleanup goals for pond residue-related contaminants will be evaluated in a site-wide Feasibility Study.

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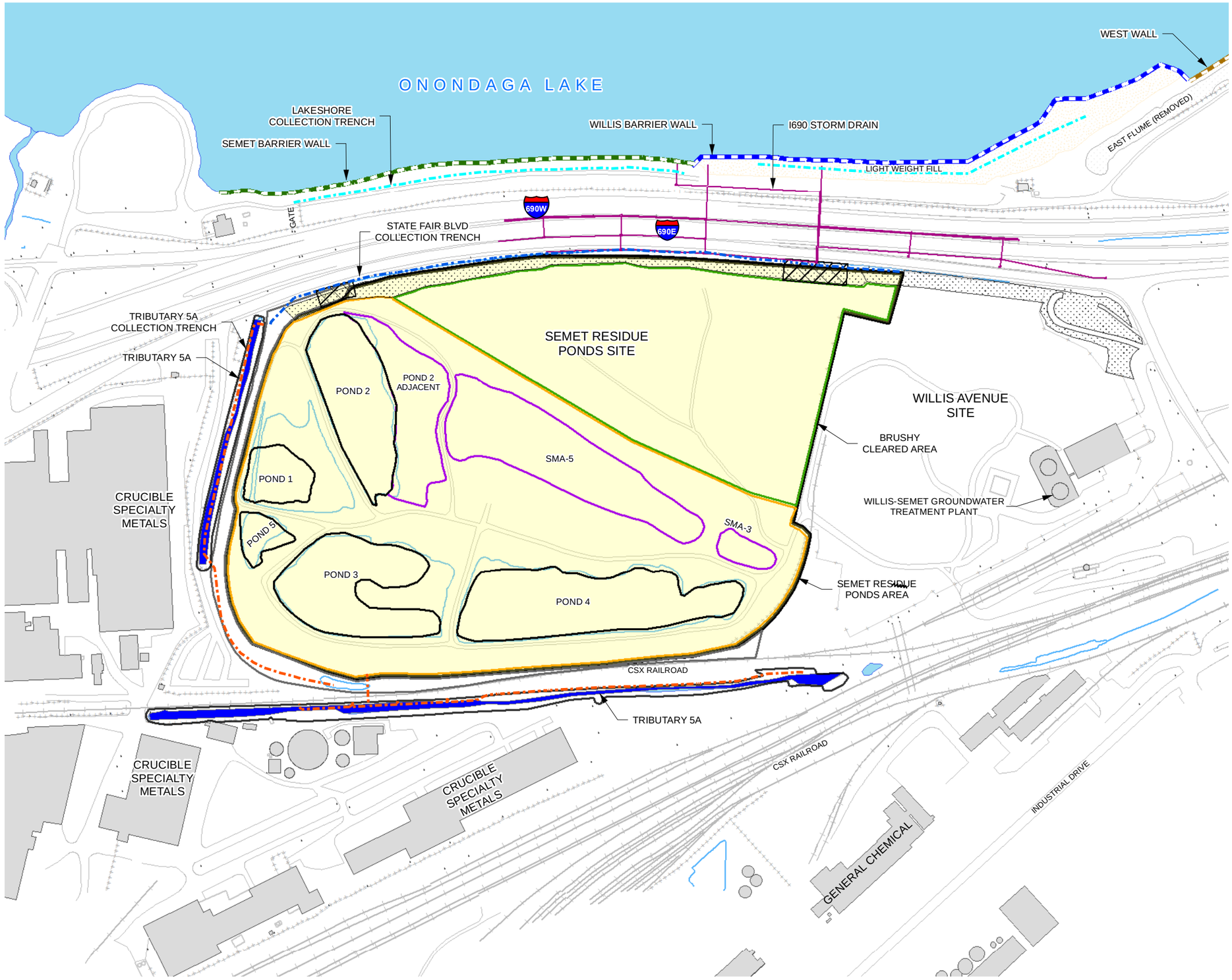
Tables

TABLE 1. Total Estimated Remaining Costs - Off-Site Thermal Processing for Beneficial Reuse

		15,000 ton/yr Off-Site Capacity	10,000 tons/yr Off-Site Capacity
Direct Capital Costs			
Remedial Construction (Removal, Dewatering, Transportation, Reuse, Odor Control, Process Aqueous Management)		$21,946,000	$23,941,000
Professional Services (CAMP, H&S)		$511,000	$767,000
Decommissioning		$448,600	$601,000
	Subtotal	$22,457,000	$24,708,000
Indirect Capital Costs			
Engineering/Management, Construction Oversight		$1,109,000	$1,534,000
Contingency (15%)		$3,436,000	$3,798,000
	Subtotal	$4,545,000	$5,332,000
Total Estimated Capital Cost (rounded)		$27,000,000	$30,000,000

Figures



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LEGEND

IRMS & REMEDIAL ACTIONS

- STATE FAIR COLLECTION TRENCH
- LAKESHORE COLLECTION TRENCH
- TRIBUTARY 5A COLLECTION TRENCH AND CAP
- I-690 STORM DRAIN
- SEMET BARRIER WALL
- WILLIS BARRIER WALL
- WEST WALL
- TRIBUTARY 5A
- TRIBUTARY 5A SEDIMENT REMOVAL
- SOIL REMOVAL AREA
- BALLFIELD / WILLIS / SEMET BERM AREA

SITE

- SEMET RESIDUE PONDS AREA
- BRUSHY CLEARED AREA
- SEMET RESIDUE PONDS SITE
- SEMET BERM AREA
- SEMET PONDS SITE BOUNDARY
- APPROXIMATE POND AREAS CONTAINING SEMET RESIDUE
- SMA/ADJACENT AREA CONTAINING SEMET RESIDUE

HONEYWELL
INTERNATIONAL INC.
SEMET RESIDUE PONDS SITE
FOCUSED FEASIBILITY STUDY
AMENDMENT
GEDDES, NEW YORK

SITE PLAN

0 150 300 600
Feet

FEBRUARY 2017
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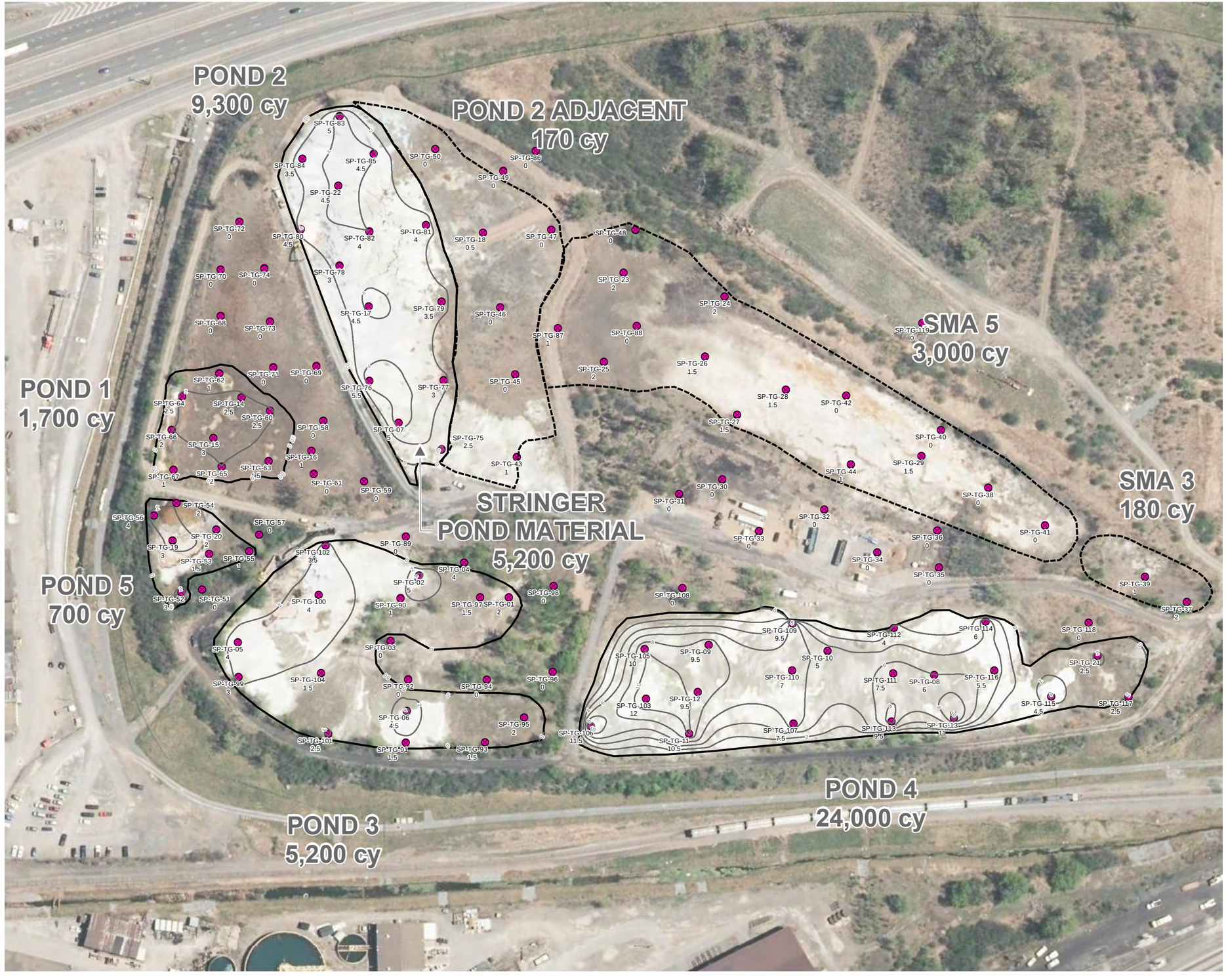
O'BRIEN & GERE ENGINEERS, INC.



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LEGEND

- TARGOST PROBE LOCATION
- SEMET RESIDUE 2-FT THICKNESS CONTOUR
- APPROXIMATE POND AREA CONTAINING SEMET RESIDUE (ASSUMED ZERO THICKNESS AT BOUNDARY)
- APPROXIMATE SMA OR ADJACENT AREA CONTAINING SEMET RESIDUE (ASSUMED ZERO THICKNESS AT BOUNDARY)

POND 2
9,300 cy

OU1 VOLUME ESTIMATE BASED ON TARGOST PROBE DATA AND GIS MODLEING.

HONEYWELL
INTERNATIONAL INC.
SEMET RESIDUE PONDS SITE
FOCUSED FEASIBILITY STUDY
AMENDMENT
GEDDES, NEW YORK

SEMET RESIDUE THICKNESS AND VOLUME ESTIMATES

0 75 150 300
Feet

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THERE'S A WAY